Bibliography of Water Standards and Studies Section Publications 1985

Water Standards and Studies, Report #86-1

Manitoba
Environment and
Workplace Safety
and Health

BIBLIOGRAPHY
OF
WATER STANDARDS AND STUDIES SECTION
PUBLICATIONS
1985

D. J. Brown
Water Standards and Studies Section
Environmental Management Services Branch
Environmental Management Division

DEPARTMENT OF ENVIRONMENT AND WORKPLACE SAFETY AND HEALTH

WATER STANDARDS AND STUDIES, REPORT #86-1

SUMMARY

Brown, D. J. 1986. Bibliography of Water Standards and Studies Section Publications, 1985. Environmental Management Division. Water Standards and Studies Report #86-1. 10pp.

The Water Standards and Studies Section, Environmental Management Services Branch, Manitoba Environment and Workplace Safety and Health produced four manuscript reports, one water quality assessment report, two water quality data reports and two miscellaneous information papers during 1985.

TABLE OF CONTENTS

	PAGE
SUMMARY	i
TABLE OF CONTENTS	ii
INTRODUCTION	1
REPORTS, MANUSCRIPT	2
REPORTS, ASSESSMENT	8
REPORTS, DATA	9
MISCELLANEOUS	10

INTRODUCTION

The reports listed in this document were prepared by staff of the Water Standards and Studies Section, Environmental Management Services Branch of the Manitoba Department of Environment and Workplace Safety and Health. Each report was distributed by the Department as it became available. Enquiries for copies should be directed to the following:

Mr. Dennis J. Brown, Head,
Water Standards and Studies Section,
Environmental Management Services Branch,
Manitoba Environment and Workplace Safety and Health,
Box 7, Building 2,
139 Tuxedo Avenue,
Winnipeg, Manitoba.
R3N 0H6.
(204) 945-7033

MANUSCRIPT REPORTS

REPORT 85-1 Brown, D. J. 1984. Bibliography of Water Standards and Studies Section Publications, 1984. Environmental Management Division. Water Standards and Studies. 11 pp.

SUMMARY

The Water Standards and Studies Section, Environmental Management Services Branch, Manitoba Department of Environment and Workplace Safety and Health produced seven reports, three water quality reports, two water quality data reports and four miscellaneous information brochures during 1984.

REPORT 85-2 Beck, A. E. 1985. Assessment of Virden Sewage Treatment Facility Discharges to Gopher Creek. Environmental Management Division. Water Standards and Studies. 44 pp + appendices.

SUMMARY

Clean Environment Commission Order #760 Clause 1(g), which prescribed discharge from a proposed deep shaft sewage treatment facility to the Assiniboine River via an enclosed pipe, was appealed by Council of the Town of Virden. Clause 1(g) was subsequently stayed by the Minister of Mines, Resources and Environmental Management until the effect of the effluent upon the receiving stream (Gopher Creek) could be assessed.

A background data base was established by collecting physicochemical data for one year prior to operation of the new treatment facility. Sampling stations were located on Gopher Creek at sites upstream and downstream of the outfall as well as in the effluent outfall itself. Following achievment of full operational status by the deep shaft sewage treatment facility, the background data base was complemented by collection of physicochemical data for another year. The water quality of Gopher Creek prior to operation of the new treatment facility was compared to conditions present in Gopher Creek after full operational status had been achieved. Reference to appropriate water quality criteria provided an assessment of water quality.

The study determined that significant water quality improvements attributable to operation of

the new facility occurred in parameters such as non filterable residues, dissolved oxygen, biochemical oxygen demand, total organic carbon, dissolved nitrate-nitrite nitrogen, total coliforms and fecal coliforms. Other parameters such as conductivity, turbidity, pH, total and filterable residues, total inorganic carbon, total kjeldhal nitrogen, ammonia, total phosphorus, sodium, chloride and sulphate were not detectably influenced by operation of the new facility. Notwithstanding the significant water quality improvements noted, inadequate dissolved oxygen levels and excessive un-ionized ammonia concentrations continued to inhibit the maintenance and propagation of sensitive cool water aquatic organisms downstream of the new treatment facility outfall. Excessive fecal coliform levels continued to render downstream reaches of Gopher Creek near the outfall unsuitable for monogastric wildlife usage, direct monogastric livestock watering and primary recreational activities. Lower reaches of Gopher Creek near the confluence with the Assiniboine River, however, were suitable for wildlife usage and direct livestock watering. This lower reach was of marginal quality with respect to primary recreational activities.

REPORT 85-3 Williamson, D. A. 1985. Bacteriological Characteristics of Twenty Recreational Beaches, Manitoba, Canada, 1984. Environmental Management Division. Water Standards and Studies. 69 pp.

SUMMARY

Surface waters may become contaminated with harmful, microbiological organisms of fecal origin as a result of some of man's activities. The presence of excessive numbers of these organisms may impair such waters for some recreational uses.

Water-borne diseases associated with bathing in surface waters are most often expressed as infections of the gastrointestinal tract as well as infections of the eyes, ears, nose and throat. Symptoms of gastrointestinal infections include mild fever, vomiting, diarrhea and stomach cramps. These symptoms typically do not last for more than several days and medical attention is usually not required.

The quality of recreational water has usually been assessed by measuring the densities of groups of "indicator" bacteria. This is necessary because

of the technical difficulties associated with analyzing water for many of the specific pathogens responsible for the various infections. Thus, when large numbers of indicator bacteria are observed, there is a significant possibility that disease causing organisms may also be present.

In very recent years, scientists have been able to link increases in the number of cases of gastroenteritis amongst bathers with increases in the densities of certain bacterial indicator groups. This link, however, is more tenuous for associating infections of the eyes, ears, nose and throat with changes in the densities of bacterial indicator groups.

Recreational water quality objectives for the fecal coliform group of indicator bacteria have existed within Manitoba for a number of years, and more recently, similar guidelines have been recommended by a joint federal-provincial working group. The findings of this group were published in 1983 within the document "Guidelines for Canadian Recreational Water Quality". The objective recommended for the indicator group fecal coliform was 200 organisms/100 mL and was expressed as a maximum 30-day geometric mean limit of a specified minimum number of samples. This recommended objective was thought to represent a maximum risk of 1.5% of contracting gastrointestinal infections while bathing. This risk could alternately be stated such that 15 persons out of every 1000 bathers could be expected to contract gastroenteritis while bathing in water containing the maximum fecal coliform limit. However, recently acquired scientific information applicable to Manitoba's fresh water, indicated that the risk of contracting gastroenteritis while bathing in water containing the maximum fecal coliform limit is probably 0.82% rather than 1.5% (or 8.2 rather than 15 expected cases of gastroenteritis per 1000 bathers).

Further, subsequent authoritative investigations have shown that the enterococcus indicator group is superior for assessing recreational water quality than the fecal coliform indicator group. Unfortunately, a recreational water quality objective for this indicator group, suitable for application within Manitoba, had not previously been developed. An appropriate objective for enterococci densities was therefore developed, for the purpose of interpreting data

from this investigation. This resultant objective for enterococci was 50 organisms/100 mL. This objective is comparable to the existing objective for fecal coliforms. That is, both are expressed as a maximum 30-day geometric mean limit and both represent an estimated risk of 0.82% of contracting gastrointestinal infections while bathing in water containing the maximum limit.

Other fecal coliform and enterococcus objectives were also utilized in order to limit the magnitude of the indicator organism densities within single samples. Exceedences of these objectives, termed the individual maximum, signal the existence of potential problems that required further investigations. The individual maximum objectives for fecal coliform and enterococcus were 400 organisms/100 mL and 100 organisms/100 mL, respectively.

The microbiological quality of twenty beaches was assessed during the summer of 1984, using observed population densities of the indicator organisms fecal coliform and enterococcus in relation to these recreational water quality objectives. The beaches were located on the east and west sides of Lake Winnipeg and within the Whiteshell Provincial Park.

The beaches located on lakes within the Whiteshell Provincial Park (Falcon (Main Beach and Faloma Beach), Star, West Hawk, Caddy, Betula, Nutimik and Dorothy) displayed excellent bacterial quality in relation to the recreational water quality objectives.

The beaches located on the east side of Lake Winnipeg (Victoria (Club House Beach and Ski Dock Area), Hillside, Lester, Grand (East Beach and West Beach), and Patricia) displayed good bacterial quality in relation to the recreational water quality objectives. Occasionally, slightly elevated values were observed in one or more of the samples collected on isolated sampling periods. However, the measured fecal coliform organism densities were within the maximum 30-day geometric mean limit. The enterococcus organism objective, developed during this investigation, was exceeded marginally on one occasion at one beach (Victoria (Ski Dock Area)).

The beaches located on the west side of Lake Winnipeg (Gimli, Sandy Hook, Winnipeg, Matlock and Sans Souci) were somewhat reduced in microbiological quality when compared to the

recreational water quality objectives. A number of individual samples contained elevated densities of both fecal coliform and enterococcus organisms. The fecal coliform 30-day geometric mean objective however, was only marginally exceeded at one beach (Matlock) on one occasion.

The use of the recreational water quality objective for enterococcus organisms, developed for this investigation, produced apparently conflicting results. The developed enterococcus maximum 30-day geometric mean limit was exceeded for a large portion of the study period at all west-side Lake Winnipeg beaches. These exceedences resulted in an estimated additional risk of contracting gastroenteritis while bathing at these beaches ranging from 0.12% to 0.32%. This corresponded to an estimated occurrence of 9.4 to 11.4 persons contracting gastrointestinal infections amongst every 1000 west side Lake Winnipeg bathers. The small magnitude of this additional risk should not have significantly impaired the recreational quality of these beaches.

Subjective estimates were made at the times of sample collections of numerous environmental factors including turbidity, wind direction, wave action as well as other related variables such as bather load. However, the observed variations in the densities of the two indicator organism groups were not correlated with these factors at any of the study beaches.

Report 85-4 Beck, A. E. 1985. Aquatic Loadings from Wind Scavenged Tailings Particulates Near Flin Flon, October-November, 1984. Environmental Management Division. Water Standards and Studies. 26 pp + appendices.

SUMMARY

Strong winds during late October and early November, 1984 scavenged particulates from the Hudson Bay Mining and Smelting Company tailings disposal area at Flin Flon, Manitoba. The events aroused local concerns about several issues including the nature of the dispersed particulates and possible impacts upon local lakes and aquatic organisms.

Site inspection and sampling were conducted January 8-10, 1985. Single 10 cm x 10 cm columns of snow and ice were collected from twenty-six

sites located on lakes within ten kilometres of the smelter stack. These were analyzed for metal and sulphate content. Water samples were also collected from each site and analyzed for general physicochemical parameters.

Total depositions of sulphate and metals were calculated for each site and regressions of depositions over distance were developed. Regression derived concentrations were compared to historical maxima and minima in order to estimate depositions attributable to windborne tailings particulates. Potential impacts upon local lakes and aquatic fauna were then assessed on the basis of dilution by the surface one metre layer on each lake and comparison to current water quality and surface water quality objectives.

The data indicated that windborne tailings particulates did not raise the rates of cadmium, copper, lead and zinc depositions detectably above local background. However, the windborne tailings particulates did increase the rates of iron and sulphate depositions above local background. Iron depositions greater than local background were detected within a two kilometre radius of the smelter stack. However, these depositions had no impact upon local aquatic organisms and no statistically significant impact upon the water physicochemistry of local lakes. Sulphate depositions greater than local background were detected within a four to six kilometre radius of the smelter stack, but could not be quantified with certainty. Thus, although total sulphate depositions had the potential to impact negatively upon local lakes and aquatic fauna, impacts attributable solely to sulphates from windborne tailings particulates could neither be demonstrated nor disproven.

ASSESSMENT REPORTS

Beck, A. E. 1985. Interim Report: Surface Water Quality Monitoring Near the URL Lease. Environmental Management Division. Water Standards and Studies. 20 pp.

SUMMARY

Water Standards and Studies Section commenced routine monthly monitoring of surface water quality downstream of the AECL-URL site on July 21, 1982. Routine monthly monitoring was terminated in March, 1984 and a series of annual surveys were substituted. A review of the data accumlated to date has not detected changes in downstream surface water quality that were attributable to development and construction of the URL.

DATA REPORTS

Brown, D. J. 1985. Water Quality Data Report: LRTAP Parameters, Manitoba Lakes, Water Quality Computer Data Base. Manitoba Environment and Workplace Safety and Health. Water Standards and Studies. 272 pp.

Brown, D. J. 1985. Water Quality Data Report: LRTAP Parameters, Manitoba Rivers and Streams, Water Quality Computer Data Base. Manitoba Environment and Workplace Safety and Health. Water Standards and Studies. 707 pp.

Beck, A. E. and D. J. Brown. 1985. Radionuclides in Well Water of South-Eastern Manitoba. Manitoba Environment and Workplace Safety and Health. Water Standards and Studies. 678 pp.

MISCELLANEOUS

Beck, A. E. 1985. Proposal For Discussion: Control of Acid Mine Drainage at Sherridon. Manitoba Environment and Workplace Safety and Health. Water Standards and Studies. 20 pp.

Brown, D. J. and A. E. Beck. 1985. Overview of Radiation in Groundwater, Lac du Bonnet Area, Manitoba - paper presented at the - Workshop on Radiation in Groundwater, Lac du Bonnet Area, Manitoba, held on April 11, 1985.

Brown, D. J. 1985. Limnology. Paper presented at the 31st Annual Water and Waste School, Winnipeg, Manitoba held February 18 - 22, 1985.

Williamson, D. A. 1985. Water Quality Objectives. Paper presented at the 31st Annual Water and Waste School; Winnipeg, Manitoba. February 18 - 22, 1985.

Williamson, D. A. 1985. Manitoba's Surface Water Quality Objectives. Paper presented at the Water and Waste Seminar; Winnipeg, Manitoba. March 18 - 20, 1985.

Williamson, D. A. 1985. Water Quality Objectives in Manitoba. Paper presented at the Western Canadian Regional Workshop on Water Quality Objectives. Regina, Saskatchewan. August 26, 1985.